may exist without the capacity of combining chemically, or, in other words, without chemical affinity. Chemical affinity (a very inappropriate term) is only known by combination; the previous attraction has never yet been shown to be of two kinds; and it seems more in accordance with Nature to diminish than to increase the number of original powers.

February 5, 1863.

Major-General SABINE, President, in the Chair.

The Earl of Caithness was admitted into the Society.

The following communication was read:—

"On the Embryogeny of *Comatula rosacea* (Linck)." By Professor WYVILLE THOMSON, LL.D., F.R.S.E., M.R.I.A., F.G.S. &c. Communicated by Professor HUXLEY. Received December 29, 1862.

(Abstract.)

After briefly abstracting Dr. W. Busch's description of the early stages in the growth of the young of *Comatula*, the author details his own observations, carried on during the last four years, on the development and subsequent changes of the larva. After complete segmentation of the yelk, a more consistent nucleus appears within the mulberry mass still contained within the vitelline membrane. The external more transparent flocculent portion of the yelk liquefies and is absorbed into this nucleus, which gradually assumes the form of the embryo larva, a granular cylinder contracted at either end and girded with four transverse bands of cilia. This cylinder increases in size till it nearly fills the vitelline sac, gradually increasing in transparency, and ultimately consisting of delicately vacuolated sarcode, the external surface transparent and studded with pyriform oil-cells, the inner portion semifluid and slightly granular.

The vitelline membrane now gives way, and, usually shortly after the escape of the larva into the water, the third ciliated band from the anterior extremity arches forwards at one point; and in the space thus left between it and the fourth band, a large pyriform depression indi-

cates the position of the larval mouth. At the same time a small round aperture, merely separated from the posterior margin of the mouth by the last ciliated band, becomes connected with the mouth by a short loop-like canal passing under the band, and fulfils the function of an excreting-orifice. A tuft of long cilia, which have a peculiar undulatory motion, is developed at the posterior extremity of the body. The larva now increases rapidly in size, assuming somewhat the form of a kidney bean, the mouth answering in position to the *hilum*. It swims freely in the water, with a swinging semirotatory motion, by means of its ciliated bands and posterior tuft of cilia.

Shortly after the larva has attained its definite independent form, ten minute calcareous spicula make their appearance, imbedded within the external sarcode-layer of the expanded anterior portion of the larva. The ten spicula are arranged in two transverse rings of five, the spicula of the anterior row symmetrically superposed on those of the posterior. By the extension of calcareous network, these spicula rapidly expand into ten plates, which at length form a trellis enclosing a dodecahedral space, open above and below, within the anterior portion of the zooid. Simultaneously with the appearance of these plates, a series of from seven to ten calcareous rings form a chain passing from the base of the posterior row of plates backwards, curving slightly to the left of the larval mouth, and ending by abutting against the centre of a large cribriform plate, which is rapidly developed close to the posterior extremity of the larva. Delicate sheaves of anastomosing calcareous trabeculæ shortly arise within these rings, and the series declares itself as the jointed stem of the pentacrinoid stage, the basal and first interradial plates of the calyx being represented by the already formed casket of calcareous network. The skeleton of the Crinoid is thus completely mapped out within the body of the larva, while the latter still retains its independent form and special organs.

Within the plates of the calyx of the nascent Crinoid two hemispherical or reniform masses may now be detected,—one superior, of a yellowish, subsequently of a chocolate colour; the other inferior, colourless and transparent. The lower hemisphere indicates the permanent alimentary canal of the Crinoid, with its glandular follicle; the upper mass originates the central ring of the ambulacral system, with its cæca passing to the arms. The body of the Crinoid is, how-

ever, at this stage entirely closed in by a dome of sarcode, forming the anterior extremity of the larva. After swimming about freely for a time, averaging from eight hours to a week, and increasing rapidly in size till it has attained a lengh of from 1 to 2 millims., the larva becomes sluggish, and its form is distorted by the growing Crinoid. The mouth and alimentary canal of the larva disappear, and the external sarcode-layer subsides round the calcareous framework of the included embryo, forming for it a transparent perisom. The stem now lengthens by additions of trabeculæ to the ends of the joints. The posterior extremity dilates into a disk of attachment. The anterior extremity becomes expanded, then slightly cupped; the lip of the cup is divided into five crescentic lobes corresponding to the plates of the upper ring; and finally five delicate tubes, cæca from the ambulacral circular canal, are protruded from the centre of the cup, the rudiments of the arms of the Pentacrinoid. At some stage during the progress of these later changes the embryo adheres, and at length becomes firmly cemented to some permanent point of attachment.

The author states his views as to the morphological and physiological relations of the larval zooid. He believes that all the peculiar independently organized zooids developed from the whole or from a part of the segmented yelk in the Echinoderms, and which form no stage in the development of the perfect form of the species, must be regarded as assimilative extensions of sarcode, analogous in function to the embryonic absorbent appendages in the higher animals. For such an organism the term "pseudembryo" is proposed. In the Echinoderm subkingdom, although constructed apparently upon a common plan, these pseudembryos present considerable range of organization, from a somewhat complex zooid provided with elaborate natatory fringes, with a system of vessels which are ultimately connected with the ambulacral vascular system of the embryo, with a well-developed digestive tract, and in some instances with special nervous ganglia, to a simple layer of absorbent and irritable sarcode which invests the nascent embryo. The pseudembryo of *Comatula* holds an intermediate position. It resembles very closely in external form and in subsequent metamorphosis the "pupa stage" of the Holothuridæ, the great distinction between them being that in the Holothuridæ the pupa has already passed through the more active "Auricularian" stage, while the analogous form in *Comatula* has been developed directly from the egg.